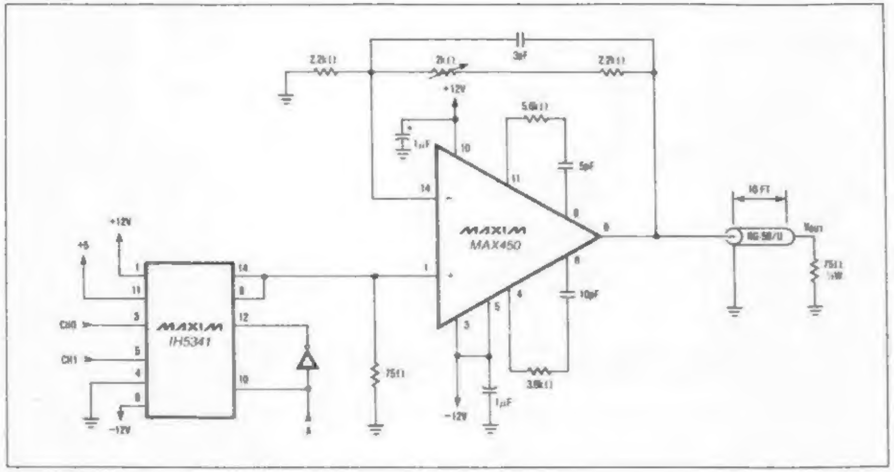


Figure 2. 2 Channel Lossless Video Switch.

Table 2: Effect of Bias Resistor (bypassed with 1µF ceramic capacitor)

R_{BIAS} (Ω) BETWEEN PINS 3 AND 5	I_Q (mA) V_{CC} = ±12V	V_{OS} (mV)	OUTPUT SWING (V) 1kHz into 75Ω	OUTPUT SWING (V) 1MHz into 75Ω	SLEW RATE (V/µs)	BANDWIDTH (MHz) GAIN = +2
0	25	±10	+4.8, -4.2	±3.5V	+100, -67	10
330	[illegible]	+20	+4.8, -4.0	±3.0V	+100, -40	9.5
500	19	+25	+4.8, -3.7	±2.9V	+100, -40	9.3
1k	15	+50	+4.7, -3.4	±2.8V	+100, -20	8.8

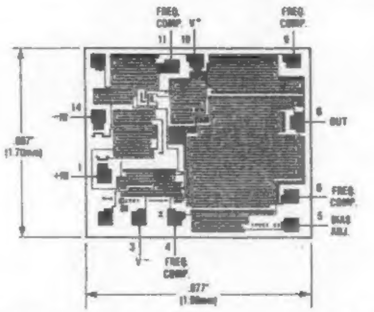
Package Information

See Maxim CMOS Data Acquisition Products Catalog for package outlines.

14 Lead Plastic DIP (Copper)
θ_{JA} = 100°C/W
θ_{JC} = 45°C/W

14 Lead CERDIP
θ_{JA} = 105°C/W
θ_{JC} = 50°C/W

Chip Topography



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INTRODUCTORY

SPECIFICATIONS BASED ON PRELIMINARY DATA

MAXIM CMOS Video Amplifier

General Description

The MAX450 video amplifier is designed to buffer and amplify signals from DC through 10MHz. This monolithic CMOS amplifier has a high impedance CMOS input, while the output can drive 75 ohm loads to greater than ±2V output swing.

Optimized for ±12V supplies, the MAX450 can operate with power supplies ranging from ±10V to ±15V. The MAX450 needs no compensation for gains greater than 20, and provides 4 terminals for two simple RC compensation networks. The MAX450 is "well behaved" and is not prone to oscillations, and the MAX450 is relatively insensitive to variations in printed circuit board layout.

Its 100V/µs slew rate and the ability to drive 75Ω loads make the MAX450 ideally suited for systems which distribute video or other 10MHz bandwidth signals via 75Ω coaxial cables.

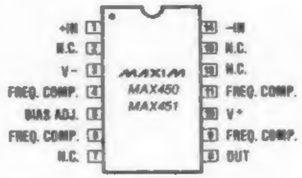
The MAX451 provides all of the features of the MAX450, plus a guaranteed 1nA maximum input bias current. This combination of low bias current and video bandwidth is well suited for vidicon preamps, for photodetector preamps in fiber optics systems up to a 10MHz bit rate, and other applications which demand low input bias current, 10MHz bandwidth, and high current output drive capability.

Applications

Video Amplifiers
PIN Photodiode Amplifiers
Vidicon Amplifiers
Pulse Amplifier
High Input Impedance Video Buffers Amplifiers
CCD Amplifier

Pin Configuration

Top View



Note:
Pin 2 and 13 have internal connections, and should never be connected. Pin 7 may be connected to GND, for compatibility with the NE5539.

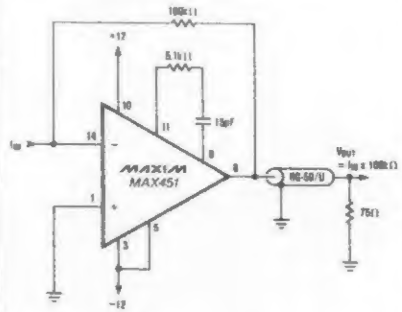
Features

- ◆ **10MHz Power Bandwidth**
- ◆ **±4.0V Output Swing into Back Terminated 75Ω Coax (R_L = 150Ω)**
- ◆ **0.1dB Differential Gain**
- ◆ **0.1° Differential Phase**
- ◆ **400pA (typical) Input Bias Currents**
- ◆ **100V/µs Slew Rate**
- ◆ **53dB Gain at 300kHz**
- ◆ **Output is Short Circuit Protected**
- ◆ **5pA/$\sqrt{Hz}$ Current Noise**

Ordering Information

PART	TEMP. RANGE	PACKAGE
MAX450CPD	0°C to +70°C	14 Lead Plastic DIP
MAX450CJD	0°C to +70°C	14 Lead CERDIP
MAX450C/D	0°C to +70°C	Dice
MAX451CPD	0°C to +70°C	14 Lead Plastic DIP
MAX451CJD	0°C to +70°C	14 Lead CERDIP
MAX451C/D	0°C to +70°C	Dice

Typical Operating Circuit



Vidicon or PIN Diode Transimpedance Amplifier

(Bandwidth = 5MHz)

CMOS Video Amplifier

ABSOLUTE MAXIMUM RATINGS

$V^+ - V^-$, pin 3 connected to pin 5 ..... +26.4V
$V^+ - V^-$, 1kΩ between pin 3 and pin 5 ..... +36V
+IN, -IN ..... $(V^+ + 0.3V)$ to $(V^- - 0.3V)$
Short Circuit Duration, V_{OUT} ..... Continuous with V^+, $V^- = \pm12V$

Power Dissipation at +25°C
Plastic Package 1250mW
(derate 10mW/°C above 25°C)
CERDIP Package 1190mW
(derate 9.5mW/°C above 25°C)
Storage Temperature ..... -65°C to +180°C

Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

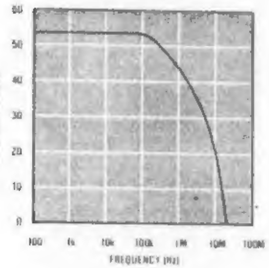
($V_{SUPP} = \pm12V$, $T_A = +25°C$)

PARAMETER	SYMBOL	CONDITIONS	MAX450 MIN	MAX450 TYP	MAX450 MAX	MAX451 MIN	MAX451 TYP	MAX451 MAX	UNITS
Input Offset Voltage	V_{OS}	$V_{OUT} = 0V$, $R_S = 100\Omega$		8			8		mV
Input Bias Current	I_{BIAS}	$V_{IN} = 0$		0.4			0.4	1	nA
Common Mode Voltage Range	V_{CMR}			±6			±6		V
Output Voltage Swing	V_{OUT}	f = 1MHz, $R_L = 150\Omega$ (Note 1)	±3	±4		±3	±4		V
		f = 1MHz, $R_L = 75\Omega$ (Note 1)	±2	±3.5		±2	±3.5		
Large Signal Voltage Gain	A_{VOL}	f = 1MHz, $R_L = 150\Omega$		200			200		V/V
Unity Gain Bandwidth	G_{BW}	$V_{OUT} = 1V_{p-p}$, $R_L = 150\Omega$		10			10		MHz
Input Capacitance	C_{IN}	Plastic		3			3		pF
		CERDIP		6			6		pF
Input Resistance	R_{IN}	DC to 100kHz		10^7			10^7		Ω
		f = 1MHz		10^6			10^6		
Output Resistance	R_{OUT}	f = 1MHz		5			5		Ω
Common Mode Rej. Ratio	CMRR	$V_{CM} = \pm1.7$, $R_S = 100\Omega$	55	66		55	66		dB
Power Supply Rejection Ratio	PSRR	$\Delta V_{CC} = \pm1V$		40			40		mV/V
Supply Current	I_{SUPP}	$V_{IN} = 0V$		25	35		25	35	mA
Slew Rate	SR	$A_V = +1$, $R_L = 150\Omega$		100			100		V/µs

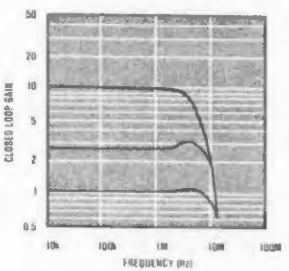
Note 1: Guaranteed by design, not production tested.

Typical Operating Characteristics

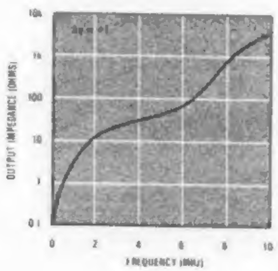
OPEN LOOP GAIN vs. FREQUENCY



CLOSED LOOP GAIN vs. FREQUENCY



OUTPUT IMPEDANCE vs. FREQUENCY



Detailed Description

Compensation, Layout and Bypassing

Figures 1 and 2 show typical applications, including the proper compensation network. Specific compensation component values for different closed loop gains are given in Table 1. For gains above 20, the MAX450/451 does not require any compensation. The easiest way to test for proper compensation is to drive the input with a low amplitude square wave and observe the overshoot. Less than 20% overshoot is normally considered acceptable. The RC network connected between pins 4 and 6 control the negative slew rate, while the RC network connected between pins 9 and 11 control the positive slew rate.

The MAX450/451, unlike many other video amplifiers, is relatively insensitive to printed circuit board layout. $+V_{CC}$ and $-V_{CC}$ should be bypassed to ground with a 0.1µF or 1µF ceramic bypass capacitor. A ground plane should be used to minimize the inductance of the ground connection, and in particular to minimize any ground return inductance that is included in both the input and output return paths.

Power Dissipation and Output Swing

The MAX450/451 operates as a class AB amplifier with the output stage quiescent current being all but 5mA of the total quiescent current. In order to operate in a class A mode for up to ±15mA output current, the MAX450/451 quiescent current is set to approximately 25mA with ±12V supplies and the Bias Adjustment pin connected directly to $-V_{CC}$. This sets the typical power dissipation to 600mW. When output current is drawn, it diverts current from the output stage and actually reduces power dissipation.

For output voltage swings less than ±8V, the output voltage swing is directly proportional to the load resistance, since the MAX450/451 output current capability is nearly independent of the output voltage swing below ±8V. The source follower configuration of the MAX450 output stage limits the no load output voltage to $+V_{CC} - 4V$.

If operation is desired over the full temperature range, the quiescent current must be reduced by connecting a resistor between $-V_{CC}$ and the Bias Adjustment pin. While reducing the quiescent current, this also creates an output offset as shown in the typical characteristics graphs. Adding a bias adjustment resistor will also reduce the DC output current capability, but the full ±30mA AC output current capability can be maintained by bypassing the bias adjustment resistor with a 0.1µF to 1.0µF ceramic capacitor. The effect of the bias resistor is shown in Table 2.

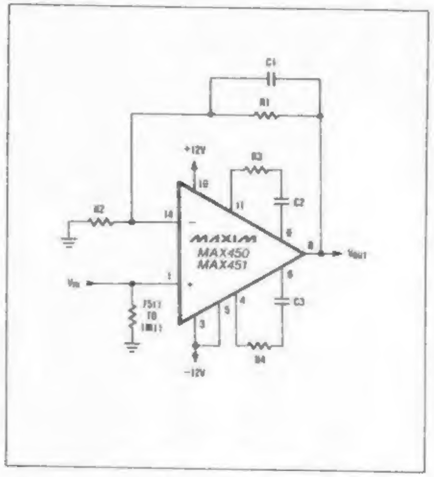


Figure 1. Non-inverting Configuration

Warmup Effects and High Speed Automatic Testing

The MAX450/451 has a typical power dissipation of 600mW. During high speed automatic testing the package temperature has not stabilized and the die temperature is lower than will be observed in actual operation. The parameters most significantly affected by this heating effect are supply current and input bias current. Maxim measures the input bias current after approximately 2 seconds, using test limits chosen such that the data sheet specification limits will not be exceeded, even after the device has been on for several minutes and has achieved thermal equilibrium.

Table 1: Component Values for Figure 1

COMPONENT	GAIN +1	GAIN +2.5	GAIN +4	GAIN +10
R1	0Ω	1.5kΩ	3kΩ	3kΩ
R2	None	1kΩ	1kΩ	330Ω
R3	2.2kΩ	4.7kΩ	4.7kΩ	5.1kΩ
R4	15Ω	1.5kΩ	5.1kΩ	None
C1	None	3pF	3pF	3pF
C2	10pF	5pF	5pF	3pF
C3	10pF	10pF	3pF	None

MAX450/451